BULGARIA SPONGIOSA.—Cups large, one inch or more broad, concave or infundibuliform, becoming nearly plane, thin, soft, subgelatinous, externally blackish, hymenium blackish-brown, often becoming porous when old; stem one-half to one inch long, slender, black, rugose or longitudinally wrinkled; asci cylindrical; spores uniseriate, globose, smooth, granular within and sometimes uninucleate, .0005 of an inch in diameter; paraphyses filiform, colored, circinate or uncinate-curved at the tips.

Buried sticks under fir trees.

The Evolution of the Cryptogams.—Upon this subject the latest writing is from the pens of MM. Saporta and Marion. In two numbers of *Nature* the work is reviewed by J. Starkie Gardner. A second volume is to follow dealing with the evolution of Phanerogams. Of course the group Cryptogams has long been recognized to be a purely artificial one, but not quite so meaningless as its old subdivisions. The origin of all animals and plants is protoplasm and when we find this in an amorphous condition and yet possessing the attributes of life we cannot be far wrong in thinking that such forms are most nearly like the primordial ones. In certain other organisms this protoplasm secretes about itself a wall and presently chlorophyll is differentiated and we have all the essentials of a vegetative life. Thus are we led from the *Protista* to *Protophytes* and particularly to the *Algæ*. *Fungi* and *Lichens* are considered as groups whose development has been arrested by a parasitic habit and to *Algæ* must we look for an explanation of the manner in which aquatic vegetation became terrestrial. The more highly organized forms have always retained their aquatic habit, and it is from the lower *Algæ* that terrestial forms have originated. The authors think that "some, with flat cellular fronds, such as *Ulva*, crept, as it is supposed, face to the ground and became ancestors of the *Hepaticæ*. Others, more confervoid, produced a thallus whose growth, necessarily apical, became complex by simple vegetative multiplication. Foliary appendicles were given off, and a sort of plantlet with rootlets, stem, and leaves, all strictly cellular, came into existence, capable, like the Mosses at the present day, of agamous reproduction. In the earliest stage of growth of the *Equisetaceæ*, of Ferns, and of *Ophioglosseæ*, we see a similar primordial cellular plant, called a Prothallus, develop from the spore, and resembling in every respect the lower *Algæ*."

The authors lay a great deal of stress upon the effect of the reproductive act upon the differentiation of primordial plants. Two widely different groups would be developed by "tardy" reproduction and by "precocious" reproduction. In low forms reproduction arrests nutritive life. Hence forms like the Mosses and *Hepaticæ* in which the reproduction is tardy, would have a long period of vegetative life in which to adapt themselves to new conditions. In fact some mosses seem very little dependent upon sexual reproduction but can propagate themselves rapidly by their radicles. The "fruit" of the moss is really a distinct plantlet which in an asexual way gives

rise to spores and these spores in turn produce new vegetative plants. This comparatively short phase in the life history of the moss which we call its fruit, or more properly "sporogone," becomes the principal part of the life of plants with precocious reproduction, such as Ferns, Equisetaceæ and Ophioglosseæ. In these cases the prothallus at once gives rise to male and female organs, and the resulting "sporogone" by its vigorous growth soon destroys all traces of the early sexual phase. This primitive thallus becomes more and more subordinated as we advance in the plant kingdom, becoming of less relative size and more and more transient. As we advance the sexes begin to be separated and the way in which this might have been accomplished is very ingeniously presented. First the spores themselves become sexual and we have microspores and macrospores and here the prothallus nearly disappears and with it "almost the last trace of the primordial cellular Alga." We would thus have both a male and a female prothallus.

At last in Phanerogams the microspore or pollen grain produces the "pollen tube" as the representative of a male prothallus; while the macrospore or embryo sac gives rise to the female prothallus, which we call "endosperm."

The whole subject is one of exceeding interest and importance and we now begin to know enough to know that our old ideas of the relations of plants hardly deserve even the epithet "crude" and that immense fields of investigation are opening before us the extent of which no man dares to measure.—J. M. C.

How Cross-Fertilization is Aided in Some Cruciferæ.—In some *Cruciferæ* the introrse anthers of the long stamens become extrorse before the pollen is shed. In the opening buds of *Brassica campestris* and *Cardamine paucisecta* the anthers of one pair of stamens —slightly surpassing the stigma—exactly face those of the opposite pair; but while the flower is expanding and before the pollen is discharged the anthers of each pair by quarter twists of the filaments—one to the right, the other to the left—are made to face in opposite directions, thus virtually becoming extrorse. Moreover, the anthers bend downward, making it still more difficult for any wind shaking to bring pollen in contact with the stigma. The anthers of the short stamens remain introrse since, the stigma being out of their reach, they can do no harm.—VOLNEY RATTAN, *San Francisco, Cal.*

Sarracenia purpurea, L.—On June 8th while collecting a few specimens of *Sarracenia purpurea*, L., I was surprised on drawing aside the petals to look at the stamens, to see the whole cavity formed by the petals and the peltate expansion of the style filled with flies as large as the common house-fly, all busy as could be eating the pollen, of which scarcely a grain could be seen. I counted fourteen flies in one flower. They were in no hurry to vacate the premises. There was a shower coming up at the time, but they were evidently there for food. Nearly every plant examined was filled in the same way.—JOSEPH JACKSON, JR., *Millbury, Mass.*